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NATIONAL DAM INSPECTION PROGRAM. WARREN H. OHL DAM(NDS 394), SU--ETC(U)
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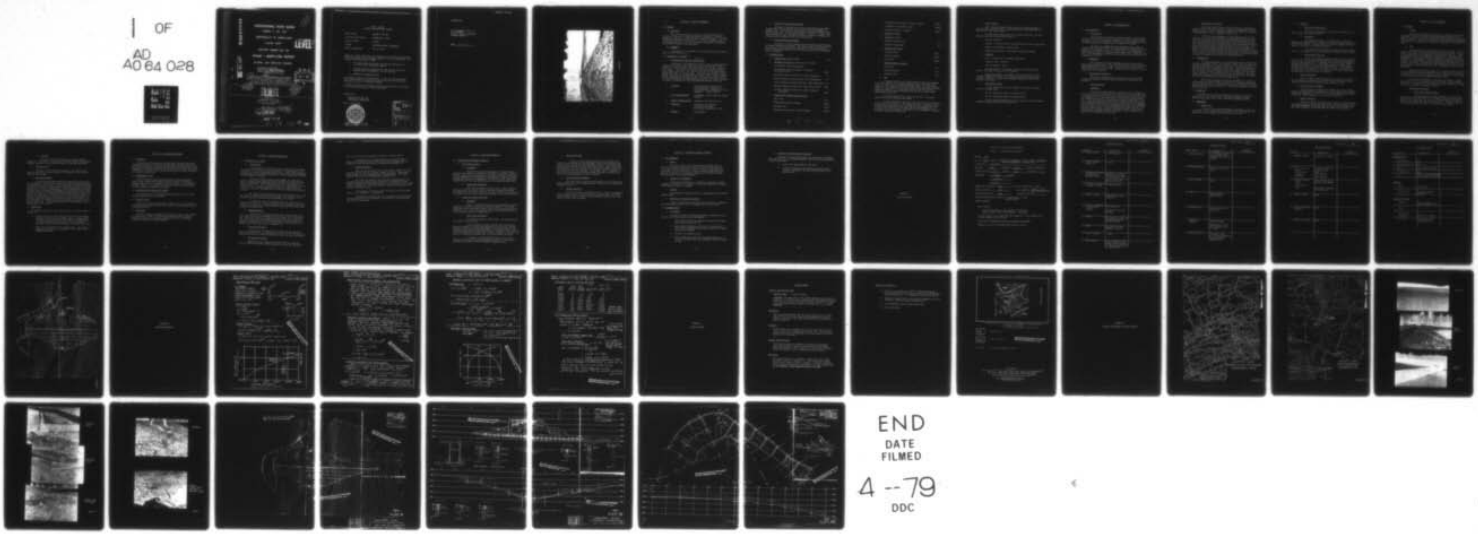

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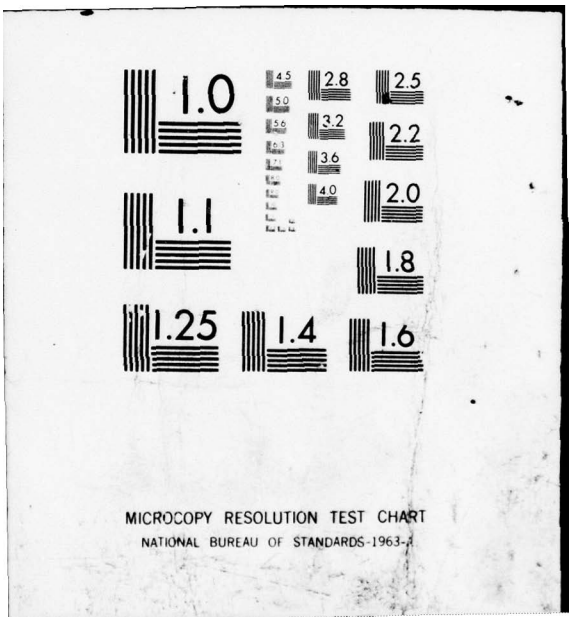
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SUSQUEHANNA RIVER BASIN

WARREN H. OHL DAM

COMMONWEALTH OF PENNSYLVANIA

CLINTON COUNTY

INVENTORY NUMBER NDS 394

LEVEL II

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

(6) National Dam Inspection Program. Warren H. Ohl Dam (NDS 394), Susquehanna River Basin, Clinton County, Commonwealth of Pennsylvania. Phase I Inspection Report.

Prepared For
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland
by
BERGER ASSOCIATES, INC
CONSULTING ENGINEERS
HARRISBURG, PA

(11) JUL[illegible] 78

(12) 48p.

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam:	WARREN H. OHL DAM
State and State Number:	PENNSYLVANIA, 18-62
County Located:	CLINTON
Stream:	McELHATTAN CREEK, SUSQUEHANNA
Date of Inspection:	May, 22, 1978

Based on a visual inspection, past performance and available engineering data, the dam and its appurtenances appear to be in fair condition. The following recommendations are made:

1. The owner should investigate the need and feasibility of a toe drain for controlling seepage.

2. The owner should investigate the cause of and control the standing water on embankment near the spillway.

3. Backfill all woodchuck holes.

The spillway capacity is not sufficient to pass the Probable Maximum Flood (PMF) without overtopping the dam but will pass 50 per cent of PMF peak inflow and is considered adequate.

A formal surveillance and downstream warning system should be developed to be used during periods of high precipitation.

Submitted By:

BERGER ASSOCIATES, INC.
HARRISBURG, PENNSYLVANIA

Date: July 5, 1978

APPROVED BY:

G. K. WITHERS
Colonel. Corps of Engineers
District Engineer

DATE: 24 Jul 78

OVERVIEW

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Dam Inspection Act, Public Law 92-367 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspections of dams throughout the United States. The Phase I Inspection and Report are limited to a review of available data, a visual inspection of the dam site and basic calculations to determine the hydraulic adequacy of the spillway.

b. Purpose

The purpose is to determine if the dam constitutes a hazard to human life and property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The Warren H. Ohl Reservoir, formerly known as Rosecrans Dam, consists of earthfill with riprap protection. The dam has a cutoff trench and a concrete cutoff wall which extends to two feet above the rock surface. The spillway is located in the left abutment and has a crest length of 100 feet. The control tower has two 12" water supply intake gates and a 24" by-pass gate. The tower is accessed by a foot-bridge. Construction was completed in January, 1965. Partial grouting of the foundation was completed in 1966. The dam crest length is 910 feet and the maximum fill height above stream bed is 59 feet. Appendix D, Plates III through VIII has photographs and details of the dam.

b.	Location:	Greene Township, Clinton County U.S. Quadrangle, Loganton, Pa. Latitude 41°-04.4, Longitude 77°-19.2' (Appendix D, Plates I and II)
c.	Size Classification:	Intermediate (2,520 acre-feet, height 59 feet)
d.	Hazard Classification:	Significant (see Section 3.1.e)
e.	Ownership:	Lock Haven City Authority 20 East Church Street Lock Haven, Pennsylvania 17745
f.	Purpose:	Water Supply

g. Design and Construction History

The dam was designed by Hill and Hill Engineers, North East, Pennsylvania, and construction was started in 1964 and completed in January, 1965. The contractor was McCormick Contracting Company, Lock Haven, Pennsylvania. An application report is on file. In 1965, application was made to grout the dam foundation to reduce the seepage, and the grouting was completed early the following year.

h. Normal Operating Procedures

The dam is for water supply and flow releases are made through the outlet structure as required. The actual intake for water supply is at the Boyd E. Keller Reservoir located about 4.5 miles downstream. Inflow occurring when water level is above elevation 1665 is discharged over the spillway.

1.3 PERTINENT DATA

a. Drainage Area (square miles)	3.17
b. Discharge at Dam Site (cubic feet per second)	
See Appendix B for calculations.	
Maximum known flood at damsite - estimated for June 23, 1972	1000
Warm water outlet at pool Elev. 1,665 (Estimated)	14
Outlet conduits at low pool Elev. 1,615 (Estimated)	25
Outlet conduits at normal pool Elev. 1,665 (Estimated)	125
Spillway capacity at pool Elev. 1,671 (top of dam)	5300
Spillway capacity at pool Elev. 1,669.7 (design) (Estimated)	3600
c. Elevation feet above mean sea level).	
Top of dam	1671
Maximum pool design surcharge	1669.7
Spillway crest	1665.0
Upstream portal invert of outlet conduit	1613.0

Downstream portal invert of outlet conduit	1605.0
Streambed at centerline of dam	1613.0
Maximum tailwater - Estimate	1615.0

d. Reservoir (miles)

d. Reservoir (miles).

Length of maximum pool	1.0
Length of normal pool	0.9

e. Storage (acre feet)

Spillway crest	1,720
Design surcharge	2,320
Top of dam	2,520

f. Reservoir Surface (acres)

Top of dam	154
Design surcharge	147
Spillway crest	110

g. Dam

A typical section of the dam is shown on Plate VII, Appendix D. The dam consists of an earthen embankment with a top width of 22 feet. The core portion is composed of fill rolled in 6 inch layers. Adjacent to the impervious core are pervious fills constructed of sands, gravel, or random fill. The upstream slope is 3.0H to 1V and has eighteen-inch-thick riprap protection from the top to about 15 feet below normal pool level.

The downstream face has a slope of 2H to 1V. The entire downstream slope is topsoiled and seeded.

At the centerline of the dam, a trench with a bottom width of 30 feet has been excavated to rock foundation, and a concrete core wall, 36 inches deep into rock, and 2 feet high, has been constructed. The core wall was eliminated on the right side of the embankment, for a distance of 350 feet because of the quality of the foundation, which was described as good, hard tight rock.

h. Outlet Conduit.

Type - 48-inch diameter reinforced concrete pipe upstream of control tower, sealed off with a flange having a 24 inch valve and a 12 inch valve in the control tower.

The 48-inch pipe downstream of the control tower has a 12 inch diameter cast iron pipe running through it.

Length - 319 feet.

Closure - A 24-inch valve, two 12-inch valves, and a 3-inch valve.

Access - foot bridge to intake tower.

Regulating facilities - gate valves, manually operated.

i. Spillway.

Type - uncontrolled, triangular shaped weir.

Length of weir - 100 feet.

Crest elevation - 1,665.

Upstream channel - rectangular channel with concrete-paved invert. The slope up to crest is 2.5 percent.

Downstream channel - rectangular, concrete-lined chute curves to right, steepens and narrows as it descends 52 feet in a horizontal distance of 500 feet. Bucket type dissipator measures 60 feet, by 30 feet, by 3 feet deep.

j. Regulating Outlets.

One 24" gated inlet to outlet conduit with invert elevation 1,613.42 in intake tower.

One 12" round sluice gate at elevation 1631.0

One 12" round sluice gate at elevation 1614.5

The 12" openings discharge from a 12" pipe into the 48" conduit immediately downstream from the control tower.

SECTION 2 - ENGINEERING DATA

2.1 Data Available.

a. Design Data.

The hydrologic and hydraulic analysis available from PennDER for Warren H. Ohl Dam was not very extensive. No area -capacity curve, frequency curve, unit hydrograph, design storm, design flood hydrograph, nor flood routings were submitted by the designer to PennDER.

The report by PennDER upon the application for a permit to construct this dam states that the required spillway capacity should be 3538 cfs for a drainage area of 3.17 sqiare miles. The design was considered satisfactory, because this flow would leave a freeboard of 0.7 feet. This was based on an 89 foot long spillway crest, which was later lengthened to 100 feet.

2. Embankment.

The information for the embankment consists of one typical section and a general plan. Eight core borings in the valley are on the plans (Appendix D, Plate VII). The borings are located on a line 74' downstream from center line of dam. Design criteria or stability calculations were not available.

3. Appurtenant Structures.

The design drawings indicate details of the control tower, conduit and spillway. Design criteria and design analysis were not available.

b. Design Features.

1. Embankment

The design drawings indicate a trench was to be excavated to the top of rock on the centerline of the dam, and a concrete cutoff wall to be constructed extending three feet into the rock, and two feet into the embankment fill. The cutoff wall, located on the centerline dam, has tapered sides above the rock surface to improve compaction of the fill. The design drawings indicate the core wall over the full length of the embankment and across the spillway. Maximum height of embankment above bottom of cutoff trench is approximately 65 feet. The impervious zone has slopes of 1H to 1V on the upstream and downstream side. The material placed outside is shown as pervious material. There are no indications of internal drains or a toe drain. The top width of the dam is 22 feet (Appendix D, Plate VII).

2. Appurtenant Structures.

The intake tower is set on rock and consists of reinforced concrete walls of varying thickness. A cradle was placed under the 48" conduit in rock. Cut-off collars are shown on the conduit at intervals of approximately 15 feet. (Appendix D, Plate VII).

A 100 foot long triangular weir was constructed on the left abutment. The hillside was excavated to accommodate the weir and spillway. The weir has a four-foot deep cut-off wall extending into rock. Ten-foot-long seepage fins are indicated on each side of the spillway. The spillway has 8" concrete paving between vertical reinforced concrete walls. The sheds and wall footings are shown to be set on rock. The walls have one foot deep keys into the rock. Horizontal drains are placed at 50 foot intervals across the spillway chute (Appendix D, Plate VIII). These 4 inch drains placed in broken stone filters are connected to an 8 inch drain on the left side of the spillway. The backfill behind the walls is indicated on the plans as pervious material.

2.2 CONSTRUCTION

The general appearance of the dam indicates that construction was made as described above. File records indicate that the cutoff wall was not installed over a length of 360 feet on the right side of the embankment because of the quality of the rock. Construction data available for review shows considerable leakage was noted during filling of this reservoir, and some grouting of the left abutment area was undertaken. Records of the grouting program are not available. Excessive uncontrolled leakage is still present along the left end of the embankment fill, and particularly near the conduit outlet.

The contract drawings required the placement of a collector system under the spillway slabs, connecting to a discharge pipe behind the left spillway wall. A collector pipe was also placed along the left abutment near the right spillway wall. Both pipes discharge a considerable flow of water.

2.3 OPERATION

The purpose of the dam is domestic water supply. No record of flows over the spillway are kept. Considerable leakage has been reported since June, 1965, a half year after impounding started.

2.4 EVALUATION

a. Availability

A full set of the design drawings was available in the files of PennDER. These drawings are very general, with little detail. No design criteria or design calculations were in the files.

b. Adequacy

1. Hydrology and Hydraulics

There was no hydrologic or hydraulic information in the files, except the permit application.

2. Embankment

The embankment design, as indicated on the contract drawings, is considered to be adequate if the pervious material would be sufficiently granular. However, with the volume of seepage, construction of a toe drain is considered desirable.

No grouting of the bedrock was performed before placement of fill. The bedrock is noted as decomposed sandstone with soft seams.

3. Appurtenant Structures

Design calculations and design criteria are not available in the files. The contract drawings indicate the type of construction and the reinforcement used. If blockage of the drain system behind the spillway walls would occur, a considerable amount of seepage could increase the hydrostatic pressure behind these walls. The footings of the spillway walls appear to be too small to resist this hydrostatic pressure under this condition. The integrity of the drain system must be preserved to prevent failure of the walls.

c. Operating Records

While no formal operating records are available for review, it was reported by the operator that leakage was the only major problem which has occurred since construction was completed in 1965.

d. Post Construction Changes

The only major post-construction change took place in 1966, when the grouting program was completed, in an attempt to reduce seepage through the foundation. In 1974 a tile drain was installed at the toe of the East (right) abutment to try to dry out this area.

e. Seismic Stability

The dam is located in Seismic Zone 1 and it is considered that the static stability is such that the dam will withstand a minor earthquake induced dynamic forces are under the normal safety margins used for static stability. No calculations were made to confirm this.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

The general appearance of this project indicates that the dam and appurtenances were formally engineered and maintenance is fair. Appendix D, Plates III through V have photographs of the dam and appurtenant structures. Appendix A contains the visual checklist. Photographs taken during the inspection are reproduced in Appendix B, Plates III, IV and V.

b. Dam

The dam embankment is maintained in fair condition. There is evidence of seepage on the slope and the toe was wet and soft in some areas. A few places on the embankment indicated mole activity. Between the embankment and the spillway is a large wet area. (See sketch in Appendix A). There was no evidence of cracking or visually detectable settlement in the embankment. Some sloughage has occurred close to the conduit. The riprap on the upstream slope and the dam crest road is in excellent condition. The drain near the downstream end of the spillway wall carried a considerable amount of water (Appendix D, Plate IV, top photograph).

During the past spring season, the dry grass on the downstream face was burned to expose any woodchuck holes. Three holes were noted and these are to be filled according to Mr. Marcinkevage. The new grass is in good condition and providing an adequate cover.

Mr. Richard Marcinkevage, Lock Haven City Engineer, stated that chemical tests of seepage water and lake water indicate different solutions. It is believed by the owner of the dam, that some or a large part of the "seepage" is caused by springs.

c. Appurtenant Structures

1. Intake Tower and Footbridge

This structure was in fair condition. One pin for the footbridge has been displaced by ice movement, causing some structural damage to the footbridge. The inside of the tower was not inspected since it was locked, and keys were not available. Portable cranks can be inserted from above the grate to operate the gate valves.

2. Spillway

The spillway crest and walls are in good condition, except for a few cracks. The spillway slab shows slight deterioration. Cracking is caused by the excessive length of individual monoliths.

d. Reservoir Area

The area is clean and well maintained. The banks do not indicate any special erosion problems. The approach to the spillway shows no obstructions.

e. Downstream Channel

The downstream channel immediately downstream is clean and well maintained. The area downstream of this dam is wooded and located in the Bald Eagle State Forest. The first structure located downstream is the Boyd R. Keller Dam and Reservoir (NDS #745) which is at a stream distance of 4.5 miles. Approximately 2.5 miles downstream of the Boyd R. Keller Dam the Community of Youngdale is located with several houses close to the stream. Although the downstream channel of the Warren H. Ohl dam is rather steep to the Boyd R. Keller dam (700 feet drop in 4.5 miles), the wooded valley and the presence of the by-pass channel at the latter dam would reduce the hazard of failure of the Warren H. Ohl Dam, although a very sudden failure would endanger the safety of the Boyd R. Keller dam. A hazard classification of "significant" seems to be appropriate for this dam.

3.2 EVALUATION

The observed condition of the project is fair. The two points of concern are:

a. Seepage between the right spillway wall and the dam embankment and in the area of the conduit outlet. Seepage could originate from the fractured rock strata below and adjacent to the dam which was not grouted or from the embankment. Additional studies should investigate and identify the source.

b. There are no weepholes in the spillway walls. The amount of leakage water could cause instability of the walls if the drain would clog up.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURE

An interview with members of the Lock Haven Municipal Waterworks indicated that there is no established procedure for operating the dam, other than maintaining the pool at spillway crest elevation 1665 as long as possible. Releases through the intake tower sluice gates are made as required for the domestic water supply intake about 4.5 miles downstream at the Boyd R. Keller Dam.

4.2 MAINTENANCE OF DAM

The dry grass was burned this past spring to expose woodchuck holes. Three burrows were observed, which according to the owner's representative, will be corrected in the near future. The new grass is in good condition. The embankment is free of unsuitable plant growth. No other maintenance program is in effect.

4.3 MAINTENANCE OF OPERATING FACILITIES

The sluice gates are operated semi-annually and there is a maintenance program for the valve stands.

4.4 WARNING SYSTEM

There is no formal warning system in effect. Due to the adequacy of the spillway in previous heavy rain storms no warning system has been considered necessary.

4.5 EVALUATION

The dam is adequately maintained and operated, except that seepage is uncontrolled. There is, however, no warning system, no regular inspection schedule by qualified engineers and in case of emergency there are no plans for a quick draw-down.

SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features

a. Design Data.

The hydrologic and hydraulic analysis available from PennDER for Warren H. Ohl Dam was not very extensive. No area-capacity curve, frequency curve, unit hydrograph, design storm, design flood hydrograph, design storm, design flood hydrograph, nor flood routings were submitted by the designer to PennDER.

In order to obtain a permit from PennDER, the owner had to provide enough spillway capacity to meet PennDER's "C" curve criterion which is explained in PennDER publication No. 41, "Construction or Repair of Dam," 1975. For a drainage area of 3.17 square miles, the "C" curve calls for a spillway capacity of 3,538 cfs. The project was designed to pass this discharge with 0.7 foot of freeboard below the top of dam.

The original design specified a weir crest 89 feet long. This was changed to 100 feet prior to construction. The spillway, as constructed, will pass 3,600 cfs with a freeboard of 1.3 feet.

No rating curves for the spillway and outlet works were submitted by the designer. Estimated ratings and area-capacity curves were calculated for this report using dimensions taken from the construction drawings (See Appendix B).

b. Experience Data.

On the date of the inspection, the Water Superintendent estimated that the 1972 flood produced a head of about 3 feet on the spillway. This would indicate a discharge of about 1,900 cfs. Comparison with the records for a nearby USGS gaging station indicates that this figure is probably high. A value of 1,000 cfs has been adopted as the maximum known flood (See Sheet 2 of Appendix B).

c. Visual Observations.

On the date of the inspection, no conditions were observed that would indicate that the appurtenant structures of the dam could not operate satisfactorily during a flood event, until the dam is overtopped.

d. Overtopping Potential.

Comparison of the estimated PMF peak inflow of 10,500 cfs, with the estimated ultimate spillway capacity of 5,300 cfs, indicates

that the potential for overtopping of Warren H. Ohl Dam exists.

An estimate of the storage effect of the reservoir shows Warren H. Ohl Reservoir does not have the storage available that is necessary to pass the PMF without overtopping (See Appendix B).

e. Spillway Adequacy.

Warren H. Ohl Reservoir has a total storage capacity of 2,520 acre-feet and the dam has an overall height of 59 feet. These dimensions indicate a size classification of "Intermediate". The hazard category for this dam is "Significant" (Section 3.1.e).

For a dam and reservoir with the above classifications, the Recommended Spillway Design Flood provided for in Appendix D of the Corps of Engineers Recommended Guidelines is in the range 1/2 PMF to PMF (5,200 to 10,500 cfs). The actual spillway capacity is 5,300 cfs or 50 percent of PMF peak inflow.

Since Warren H. Ohl Dam can pass 50 percent of the PMF peak inflow, it is considered to be adequate.

The hydrologic analysis for this investigation was based upon existing conditions of the watershed. The effects of future development were not considered.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

1. Embankment

There were no visual observations of undue embankment stresses, which would be indicated by sloughage or cracking. There are, however, large areas of extremely wet soft spots along the downstream toe and immediately downstream from the embankment, indicating seepage through the foundation or embankment. All water is clear, showing no transportation of the fine materials with the present hydraulic head.

2. Appurtenant Structures

There are no apparent critical areas. Some cracking of walls and slabs is evident, but do not present a potential problem. The condition of the access bridge to the control tower is poor, due to ice damage, and any failure could cause problems in case of emergencies.

b. Design and Construction Data

1. Embankment

There is no design criteria for the embankment stability available. The borings indicate good stable foundation. The design slopes and lack of settlement indicate that the design was adequate for pool levels up to spillway elevation; however, the questionable nature of the pervious shell is of some concern.

2. Appurtenant Structures

The spillway slab is 8 inches thick. The spillway walls are founded in the rock cut.

A pipe collection system is placed under the spillway slabs and connects to a drain pipe adjacent to the left wall footings. Movement of the walls has been precluded by the effectiveness of this collection system and the pervious backfill. Blockage of the system, at its one discharge point, would lead to serious problems in the walls and slabs if a hydrostatic pressure were to build up behind the walls.

No distress or displacement was found in any of the spillway walls, except the cracking observed because of the length of individual monoliths and lack of adequate expansion joints.

c. Operating Records

While no formal operating records were available for review, it was reported by the dam manager that no major problems have occurred since the dam has been operational (1965). It was noted that the facility withstood the floods of tropical storms Agnes in 1972 and Eloise in 1975. It was indicated that the amount of water coming out of the collection pipes was constant. The geologic report in Appendix C points out that ground water leakage along fractures is possible, but that no increased permeability can be expected.

d. Post Construction Changes

There have been no reported modifications to the original dam design, except that some grouting was done in 1966 and a tile drain was installed in 1974.

e. Seismic Stability

This dam is located in Seismic Zone No. 1 and it is considered that the static stability is sufficient to withstand minor earthquate induced dynomic forces. However, no calculations, studies, etc., were made to confirm this conclusion.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

The visual inspection, review of design drawings and the operational history indicate that the dam is in fair condition, but is in need of remedial measures to control seepage on the downstream slope and at the toe, and also to control possible seepage below the dam and the spillway. The spillway capacity is one-half of the PMF peak inflow and is considered adequate.

b. Adequacy of Information

The available information is considered sufficient to make a reasonable assessment of the project. Additional information is needed to determine the source of seepage.

c. Urgency

Recommendations presented should be implemented at the earliest possible time.

d. Necessity for Additional Studies

A need for additional studies of these facilities is indicated. Attention should be given to the recommendations presented below.

7.2 RECOMMENDATIONS

a. Facilities

In order to assure a continued satisfactory operation of this facility, the following actions are recommended:

1. Owner should control the seepage existing on the embankment slope and along the toe.

2. Owner should investigate the cause of and provide for the control of standing surface water between the embankment and the spillway.

3. Backfill all woodchuck holes.

4. Owner should monitor and record seepage quantities. If the flow increases with time, implement remedial measures at once.

b. Operation and Maintenance Procedures

Although the dam and facilities are maintained in reasonably good condition, it is considered important that the following procedures should be developed:

1. A pool staff gage should be installed.

2. A formal surveillance and downstream warning system should be developed to be used during periods of high precipitation.

APPENDIX A

VISUAL INSPECTION

CHECK LIST - DAM INSPECTION PROGRAM

PHASE I - VISUAL INSPECTION REPORT

NAD NO. 394

PA. ID # 18-62 NAME OF DAM Warren H. Ohl Reservoir, (Rosecrans Dam - Original Name) HAZARD CATEGORY Significant

TYPE OF DAM: Earth Fill

LOCATION: Greene TOWNSHIP Clinton COUNTY, PENNSYLVANIA

INSPECTION DATE 5-22-78 WEATHER Clear TEMPERATURE 75

INSPECTORS: H. Jongsma G. Errick

A. Bartlett

R. Steacy

NORMAL POOL ELEVATION: 1665 AT TIME OF INSPECTION: 1665.1

BREAST ELEVATION: 1671 POOL ELEVATION: approx. .1 foot above spillway crest

SPILLWAY ELEVATION: 1665 TAILWATER ELEVATION:

MAXIMUM RECORDED POOL ELEVATION: 3' over Crest '72 flood (per Mr. Ohl)

GENERAL COMMENTS:

Local Contacts

Richard Marcinkevage - City Engineer - Lock Haven
Stanley Stukel - Water Superintendent - Lock Haven

No water supply to Lock Haven from this reservoir - only releases water to lower reservoir for city use.

Entire toe of embankment slope wet and soggy from leakage.

Reddish color stain in channel below outlet to creek.

VISUAL INSPECTION

EMBANKMENT	OBSERVATIONS	REMARKS & RECOMMENDATIONS
A. SURFACE CRACKS	None Observed.	
B. UNUSUAL MOVEMENT BEYOND TOE	None.	
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	Woodchuck hole about 5'. Below breast 100'west of outlet pipe & 150' east of outlet pipe & 25' above outlet elev.	
D. VERTICAL & HORIZONTAL ALIGNMENT OF CREST	Straight and level.	
E. RIPRAP FAILURES	Looks sound in good condition.	
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	Good Condition. Wet area on fill near spillway.	
G. SEEPAGE	Heavy flow @ or near outlet headwall and near spillway channel.	
H. DRAINS	Tile drains in right abutment. Active!	
J. GAGES & RECORDER	None	
K. COVER(GROWTH)	Grass on breast & downstream slope (burned off in some areas previously-now growing over).	

VISUAL INSPECTION

OUTLET WORKS	OBSERVATIONS	REMARKS & RECOMMENDATIONS
A. INTAKE STRUCTURE	Some leakage - could not see from where. Floor grating welded down and locked.	
B. OUTLET STRUCTURE	48 inch pipe and weir plate.	
C. OUTLET CHANNEL	Good.	
D. GATES	Seldom operated - Hand cranked.	
E. EMERGENCY GATE	24 inch valve on 48 inch pipe.	
F. OPERATION & CONTROL	Seldom operated. Operated all 3 valve (12") twice/year per S. Stukel.	
G. BRIDGE (ACCESS)	50'±long 3' wide on 2 piers (one shifted by ice, partially damaging span)	

DAM NO. NAD 394

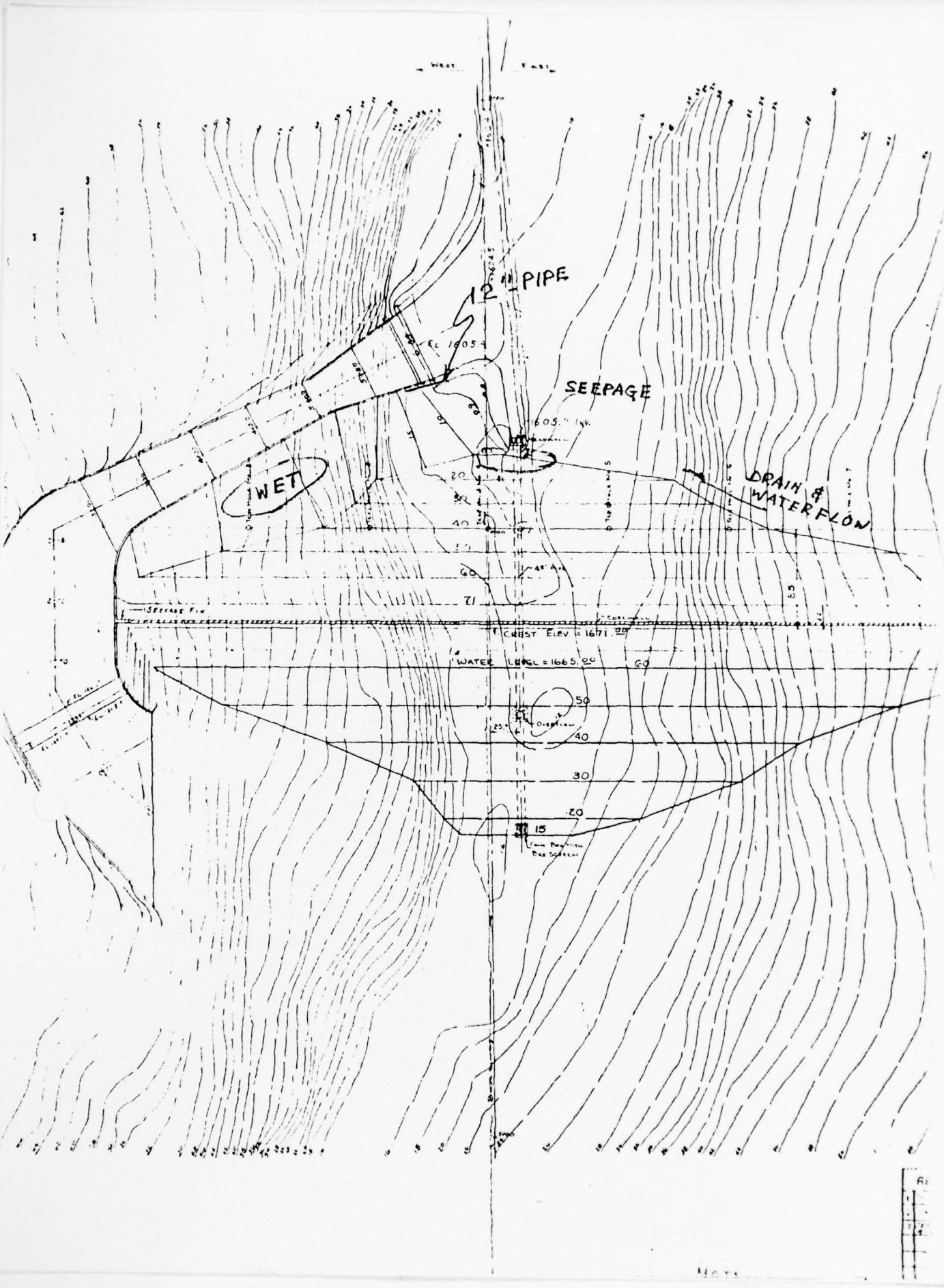
VISUAL INSPECTION

SPILLWAY	OBSERVATIONS	REMARKS & RECOMMENDATIONS
A. APPROACH CHANNEL	Concrete Vert. Walls	
B. WEIR: Crest Condition Cracks Deterioration Foundation Abutments	Concrete Crest (6'-2" to top of wall) None None Apparent Good Condition.	
C. DISCHARGE CHANNEL Lining Cracks Spilling Basin Walls	Concrete-Some cracks patched with asphalt. Some cracks & seepage - not significant.	
D. BRIDGE & PIERS	None	
E. GATES & OPERATION EQUIPMENT	None	
F. CONTROL & HISTORY	None	

DAM NO. NAD 394

VISUAL INSPECTION

MISCELLANEOUS	OBSERVATIONS	REMARKS & RECOMMENDATIONS
INSTRUMENTATION		
Monumentation	None	
Observation Wells	None	
Weirs	Part of weir at outlet.	
Piezometers	None	
Other	Approx. 22 uncapped casings on dam breast for grouting.	
RESERVOIR		
Slopes	Flat-cleared	
Sedimentation	None experienced or observed.	
DOWNSTREAM CHANNEL		
Condition	Mostly woodland to other Reservoir, (#745)	
Slopes		
Approximate Population	None first 5-6 miles.	
No. Homes	None Apparent until below next dam.	


12" PIPE
SEEPAGE
WET
DRAIN & WATERFLOW
WATER LEVEL = 1665.00
CREST ELEV. = 1671.00
50
40
30
20
15

APPENDIX B

HYDROLOGY/HYDRAULICS

PROJECT Dam Investigation SHEET NO. 1 OF

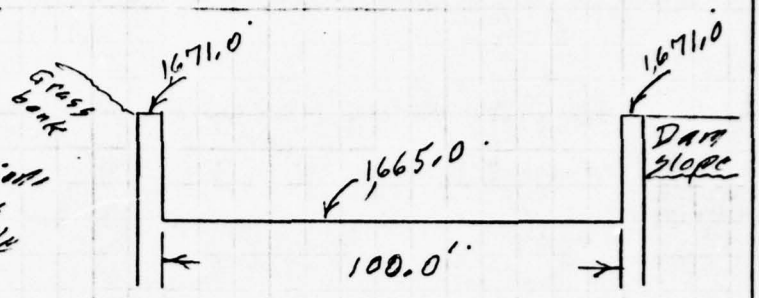
SUBJECT Warren Ave. Obl. Dam ID # 394

COMPUTED BY RES DATE 5-25-'78 CHECKED BY JJPJr 5-30-78

Spillway Rating

"C" Value

For Forests + Waters used 3.3 in their analysis of application. King's Handbook gives 3.87 (6th Edition, Table 5-8.) Use 3.6



Top of dam = 1671

C = 3.6

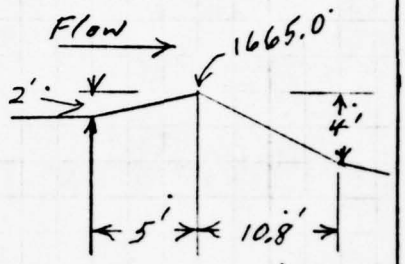
L = 100

H = 1671 − 1665 = 6'

$Q = C L H^{3/2}$

$= 3.6 \times 100 \times (6)^{3/2}$

$= 5,291$ use 5,300 cfs



Elev. 1669

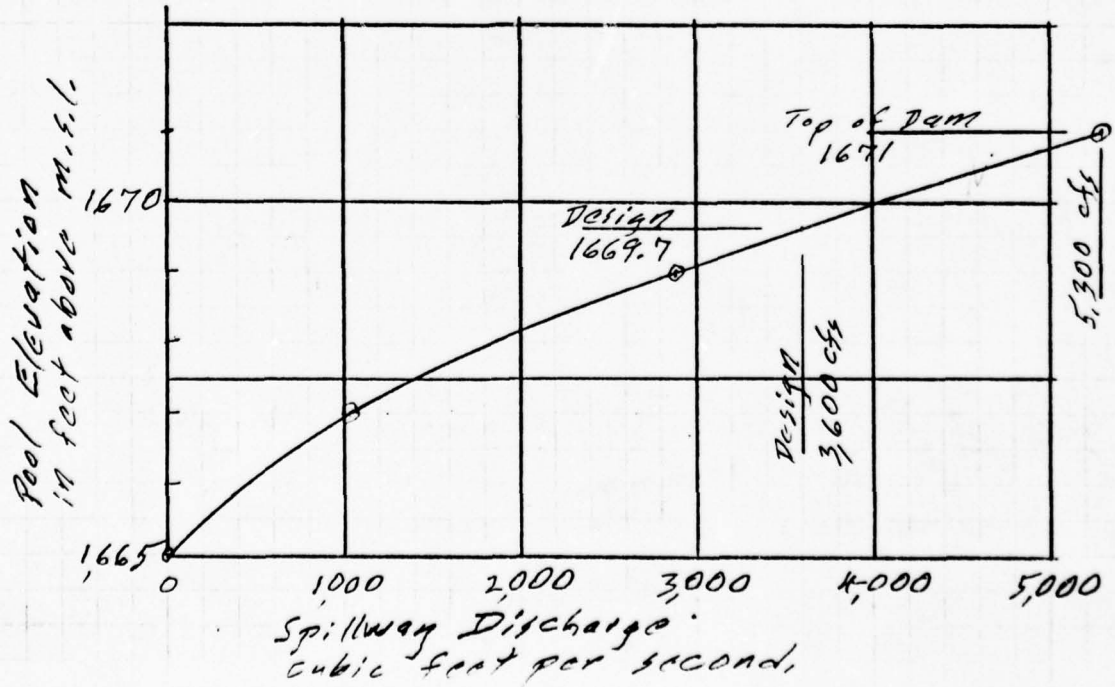
C = 3.6, L = 100, H = 1669 − 1665 = 4'

$Q = 3.6 \times 100 \times (4)^{3/2} = 2,880$ cfs

Elev. 1667

C = 3.6, L = 100, H = 1667 − 1665 = 2'

$Q = 3.6 \times 100 \times (2)^{3/2} = 1,018$ use 1,020 cfs



PROJECT Dam Investigation SHEET NO. 2 OF 4
SUBJECT Warren H. Ohl Dam ID # 394
COMPUTED BY RES DATE 5-25-78 CHECKED BY JJRJr 5-30-78

Maximum known flood at damsite

1. No records are kept and there is no pool-stage gage. The Water Superintendent thinks there was a head of about 3 feet on the spillway at the peak of the 1972 flood. This would be about 1,900 cfs.
2. The USGS gaging station, March Creek at Blanchard, Pa. (Drainage Area 44.1 sq. Mi) had a peak discharge of 4,870 cfs on June 23, 1972. Adjusting for the 0.8 power of the ratio of the drainage areas gives:

$$\left(\frac{3.17}{44.1}\right)^{0.8} \times 4,870 = 593 \text{ cfs}$$

3. Use about 1,000 cfs on June 23, 1972.

Warm-water outlet There is a 12" CI pipe connected to 12" standpipe in outlet tower, which may be used to skim off surface water if pool level is up to the spillway crest. Compute as 12" pipe. Length = 7 + 52 + 215 = 274 ft $H = 1665 - 1606.6 = 58.4$ ft., $n = 0.015$

$$V = \frac{0.590}{n} d^{2/3} \times S^{1/2} \qquad S = \frac{58.4}{274} = 0.213$$

$$= \frac{0.590}{0.015} \times (1)^{2/3} \times (0.213)^{1/2}$$

$$= 39.3 \times 1 \times 0.462$$

$$= 18.2 \text{ ft/s}$$

$$Q = VA = 18.2 \times \pi \times (0.5)^2$$

$$= 14 \text{ cfs}$$

Outlet conduit at low pool.

Basic conduit is a 48" Reif. conc. pipe. Control is a 24" valve in outlet tower. Compute as 24" dia orifice.

$Q = Ca\sqrt{2gh}$ $C = 0.60$, $h = 1615 - 1613.42 = 1.58$ ft

$a = \pi R^2 = \pi 1^2 = 3.14 \text{ ft}^2$

$= 0.60 \times 3.14 \times (64.3 \times 1.58)^{1/2}$

$= 1.88 \times 10.1$

48" Pipe = 19 cfs
12" Pipe = 6
Total = 25 cfs

There is also a 12" pipe, $L = 220$ $n = 0.015$

$S = \frac{1615 - 1606.6}{220} = 0.038$, $V = \frac{0.590}{n} \times d^{2/3} \times S^{1/2}$

$V = \frac{0.59}{0.015} \times (1)^{2/3} \times (0.038)^{1/2} = 7.67$ $Q = VA = 7.67 \times \pi \times (.5)^2 = 6$

PROJECT [illegible] SHEET NO. 2 OF

SUBJECT Warren H. Ohl Dam ID # 394

COMPUTED BY RES DATE 5-26-78 CHECKED BY JPJr 5-30-78

Outlet conduit at normal pool = 1665.

48-inch pipe see sheet 2

$Q = ca\sqrt{2gh}$ $c = 0.60$, $a = 3.14$.

$h = 1665 - 1613.42 = 51.58$.

$Q = 0.60 \times 3.14 \times (64.3 \times 51.58)^{1/2}$

$= 1.88 \times 57.6 = 108$ cfs.

12-inch pipe $L = 220$; $n = 0.015$.

$S = \frac{1665 - 1606.6}{220} = 0.265$.

$V = \frac{0.590}{n} \times (d)^{2/3} \times (s)^{1/2} = \frac{0.590}{0.015} \times (1)^{2/3} \times (0.265)^{1/2}$

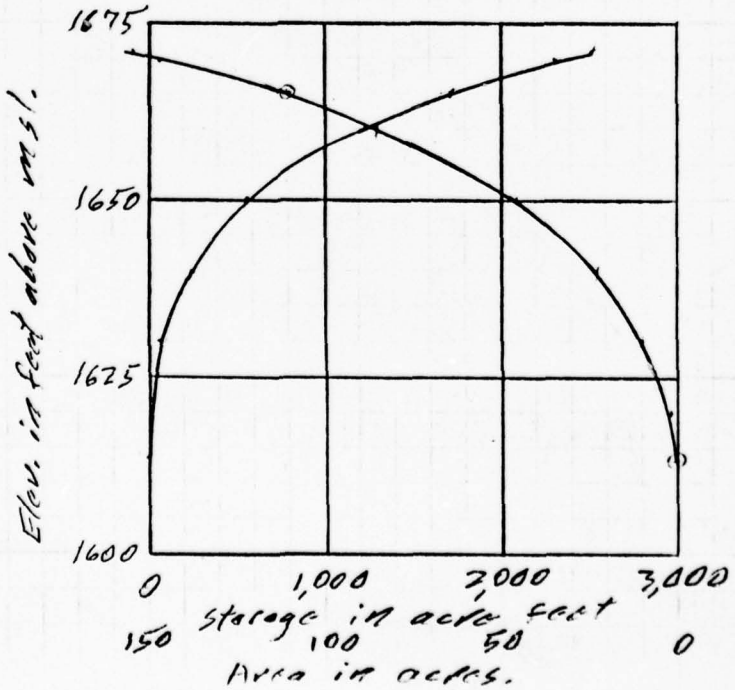
$= 20.2$ ft/sec, $Q = VA = 20.2 \times \pi \times (0.5)^2 = 16$ cfs

---

Total Q = 108 + 16 = 124 cfs, Use 125 cfs

Storage and Area

Normal pool Elev. 1665 = 103 acres from USGS Topo Sheet
117 acres from application
Use 110 acres.
= 1719 acre feet from application



PROJECT

SUBJECT Warren H. Ohl Dam I.D # 394 SHEET NO.

COMPUTED BY RES DATE 5-26-'78 CHECKED BY JJPJr 5-30-78

Storage and area (cont.)

Elev. (ft.)	Area (acres)	Av. Area (acres)	Vol. (acre ft)	Total Vol. (acre ft)	
1613	0	1.0	7.0	0	
1620	2.	6.0	60	7.	
1630	10.	16.5	165	67.	
1640	23.	34.5	345	232	
1650	46.	65.5	655	577	
1660	85.	97.5	487.5	1232	
1665	110.	128.5	604	1720	Normal Pool
1669.7	147.	150.5	195.6	2324	Design Pool
1671	154			2520	Top of Dam

Overtopping Potential

Susquehanna Basin - Region 1

Drainage Area 3.17 sq. mi.

PMF = 3,300 cfs/sq mi.

$3.17 \times 3,300 = 10,500$ cfs (From curves furnished by Balt. Dist. Corps of Eng.)

T = 23 Hours.

$$\frac{\text{Max Spillway capacity}}{\text{Peak Inflow}} = \frac{5,300}{10,500} = 0.50$$

$$\frac{\text{Req. Resv. Storage}}{\text{Vol of Inflow Hydrograph}} = 0.50$$ (From short cut method furnished by Balt. Dist. Corps of Eng.)

$$\text{Vol. of Inflow} = \frac{10,500 \times \frac{23}{24}}{2}$$

$= 5,030$ cfs days.

$= 9,980$ acre feet.

For 26" runoff, Vol. $= 53.33 \times 26 \times 3.17 = 4400$ acre ft (USC)

Req. Resv. Storage $= 0.50 \times 4,400 = 2,200$ ac. ft.

Avail storage $= 2520 - 1720 = 800$ ac. ft.

Potential for overtopping exists

Spillway can pass 50 percent of PMF peak flow.

APPENDIX C

GEOLOGIC REPORT

GEOLOGIC REPORT

Bedrock - Dam and Reservoir.

Formation Name: Juniata Formation

Lithology: The upper part of the Juniata Formation is described in reference (1) as red to brown, medium grained cross bedded sandstone with up to 25% siltstone and shaly siltstone interbeds. The underlying Bald Eagle Formation, shown on the map, fig. 1, is a brown sandstone.

Overburden.

Core boring logs indicate that the valley sides had one to eight feet of brown silty clay, sand and rock fragments over weather bedrock. Alluvium in the valley consisted of about seven feet of sand and cobbles.

Structure.

The Rosecrans Dam is located near the axis of the White Deer Syncline. The dip of the bedding here is very flat. The principal fracture directions, as indicated by air photo fracture traces are N45°W, N5° to 10°W, N80°E.

Aquifer Characteristics

The Juniata Formation is composed of essentially impermeable rocks. Ground water movement is almost entirely along bedding planes and fractures. The fractures in the valley of McElhattan Creek are probably a locus of some ground water movement.

Discussion.

The Juniata Formation is resistant to weathering, and has good foundation stability, reference (1). Some ground water leakage along fractures under the dam is possible. Increased permeability due to ground water movement in the bedrock is highly unlikely due to the insoluble, firmly cemented nature of the rock.

Sources of Information.

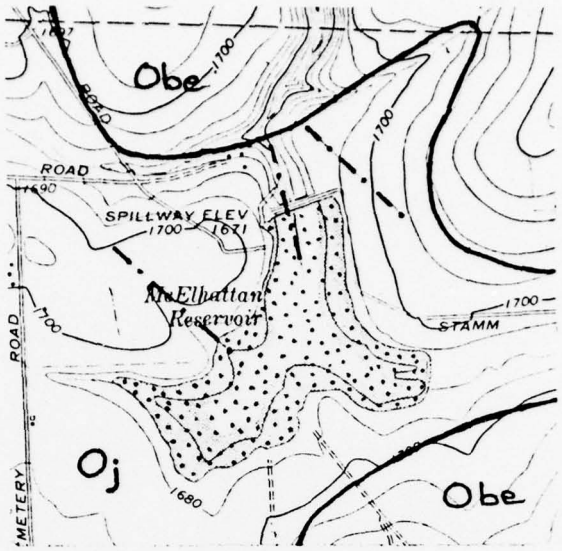
1). Faill, R.T. and Wells, R.B. (1977) "Bedrock Geology and Mineral Resources of the Linden and Williamsport Quadrangles, Lycoming County, Pa." Pa. Geological Survey, Atlas 134 ab.

2). Manuscript geologic map of the Loganton quadrangle, open file (1977) Pa. Geological Survey, Harrisburg, Pa.

3). Air Photographs, scale 1:24,000, dated 1963.

4). Core boring logs.

GEOLOGIC MAP - W. H. Ohl Data



(Geology from: Manuscript Geologic Map, open file;
Loganton Quadrangle;
Pa. Geologic Survey, Harrisburg)

Oj	Juniata Fm.
Obe	Bald Eagle Fm.
—·—·—	air photo fracture trace

SCALE 1:24000

1 0 1 MILE

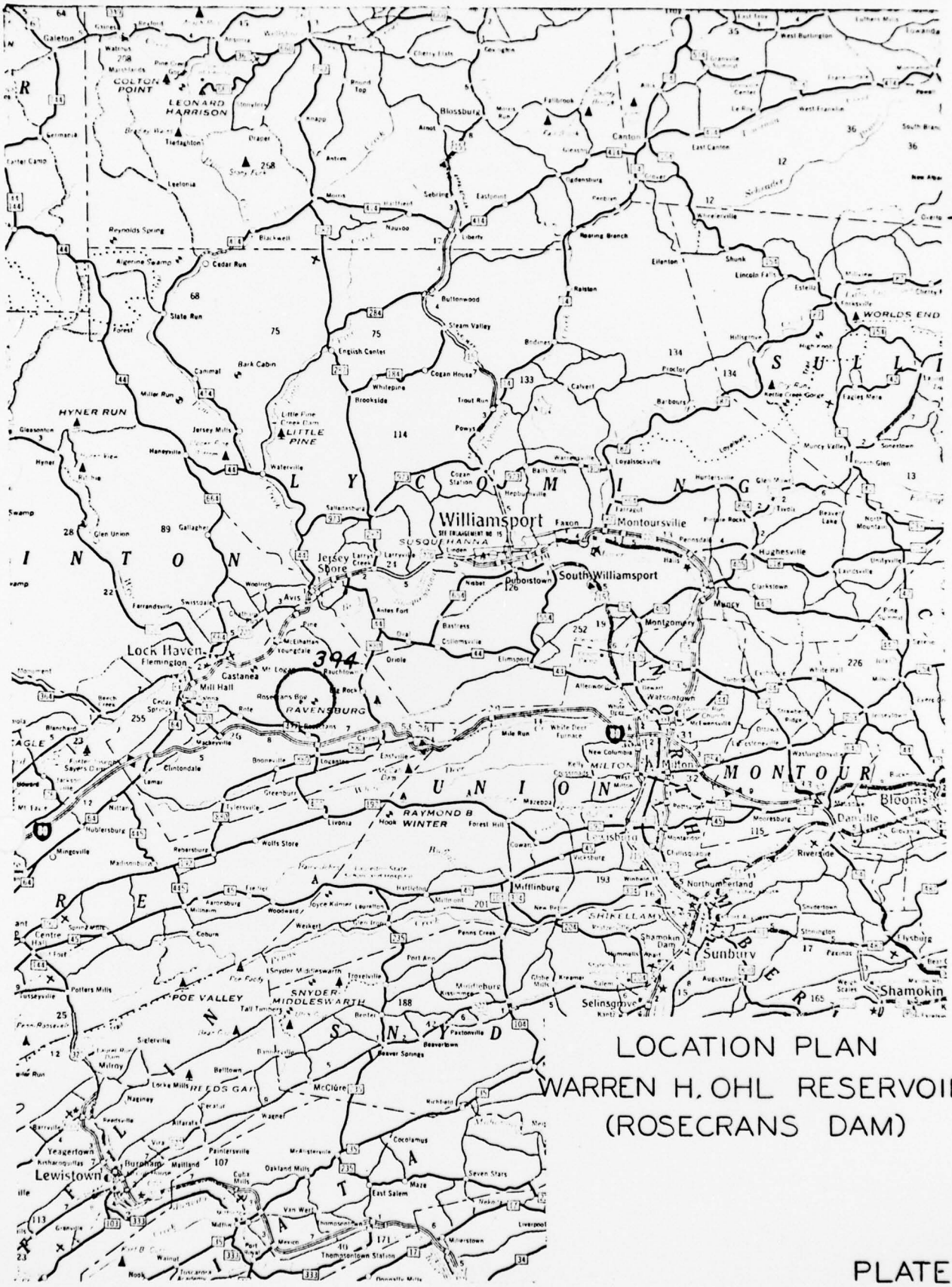
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

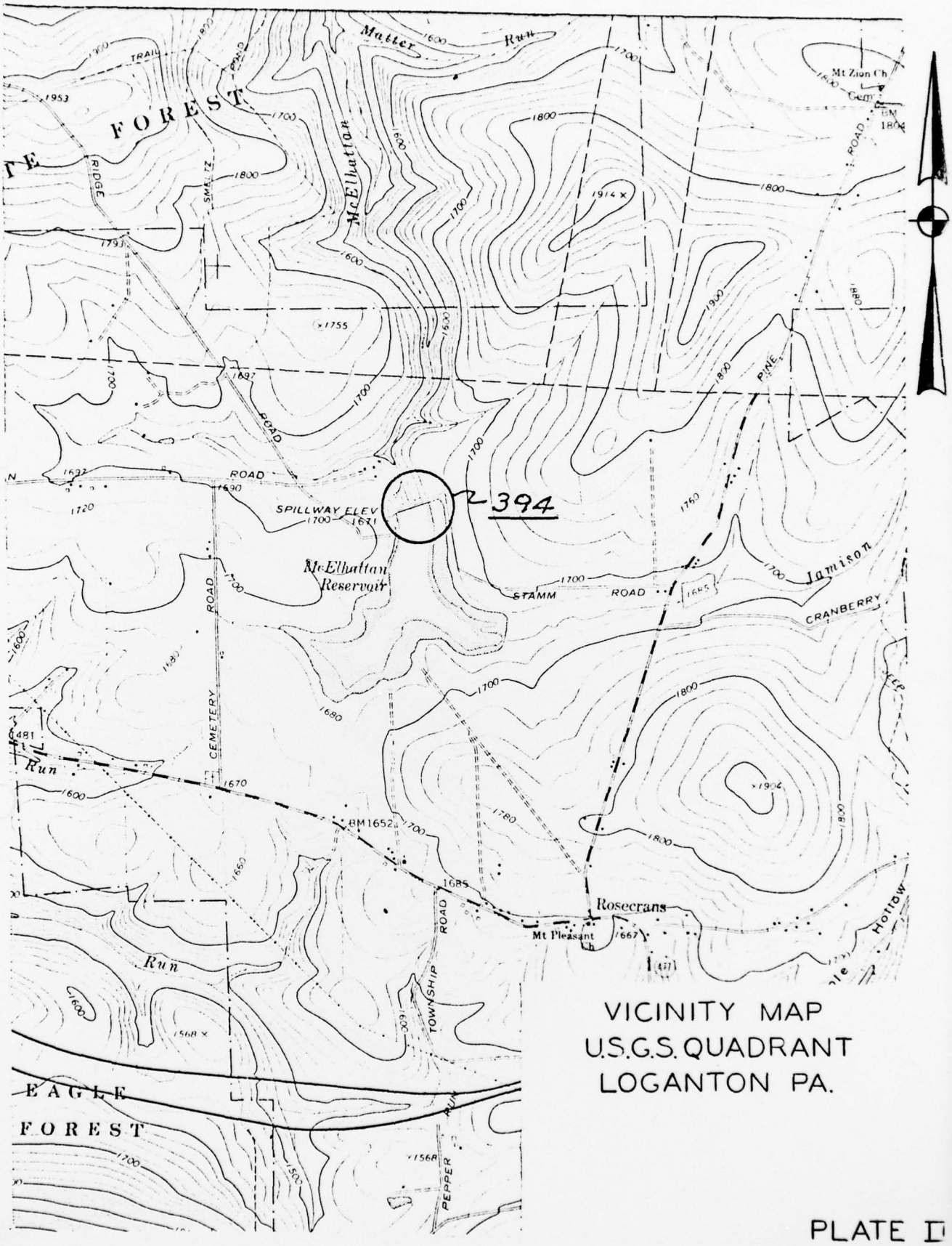
APPENDIX D

LOCATION, PHOTOGRAPHS & DESIGN DRAWINGS



LOCATION PLAN
WARREN H. OHL RESERVOIR
(ROSECRANS DAM)

PLATE I

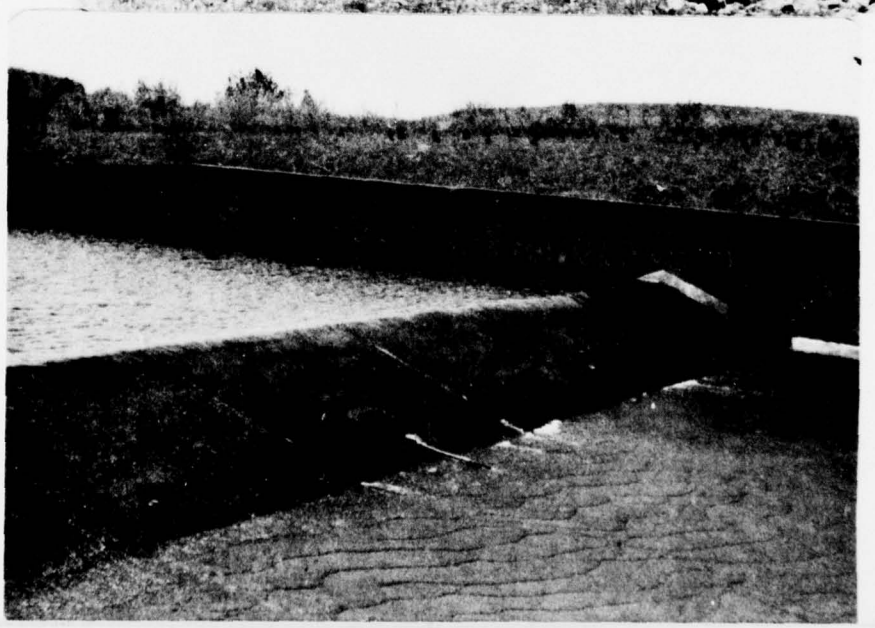


VICINITY MAP
U.S.G.S. QUADRANT
LOGANTON PA.

PLATE D

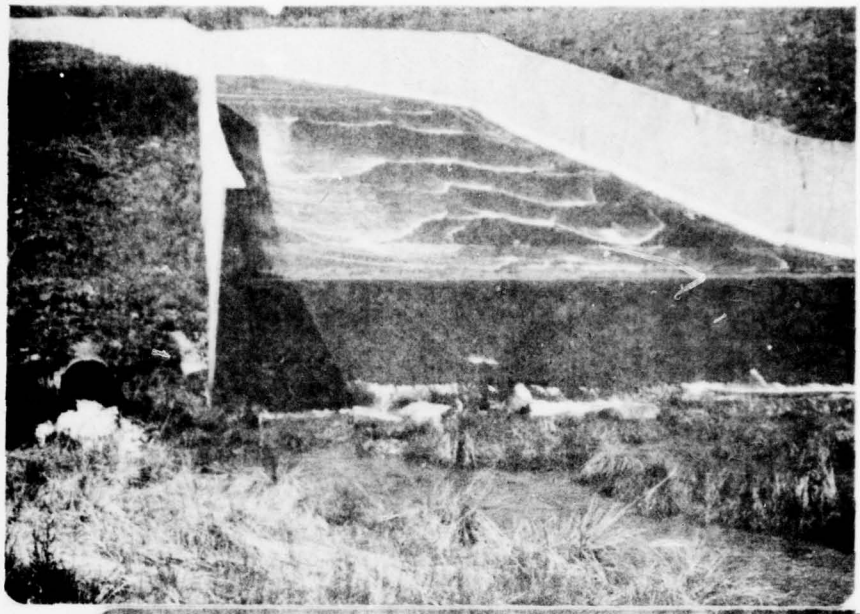
Reservoir

Right
Abutment

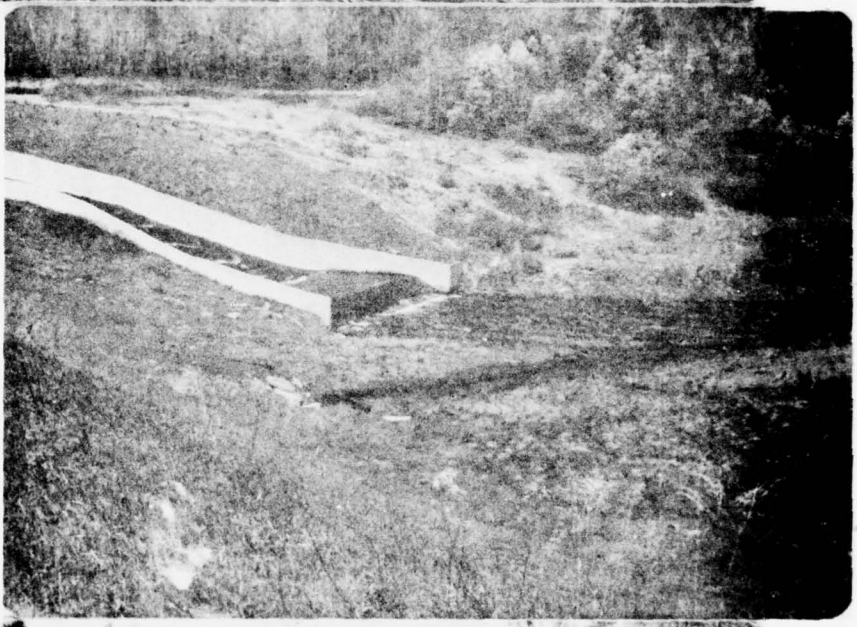


Spillway
Weir

PLATE III



Stilling
Basin

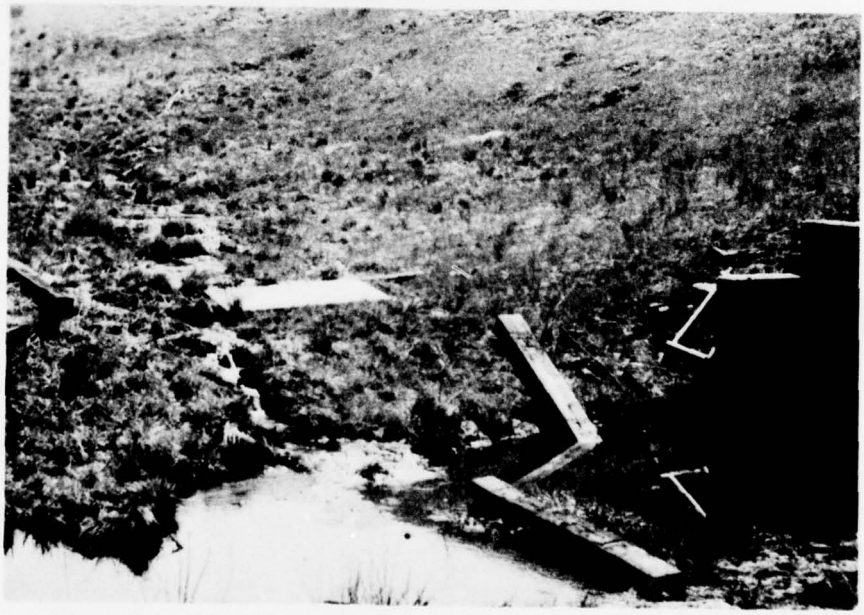


Downstream
Toe

Seepage close
To Spillway

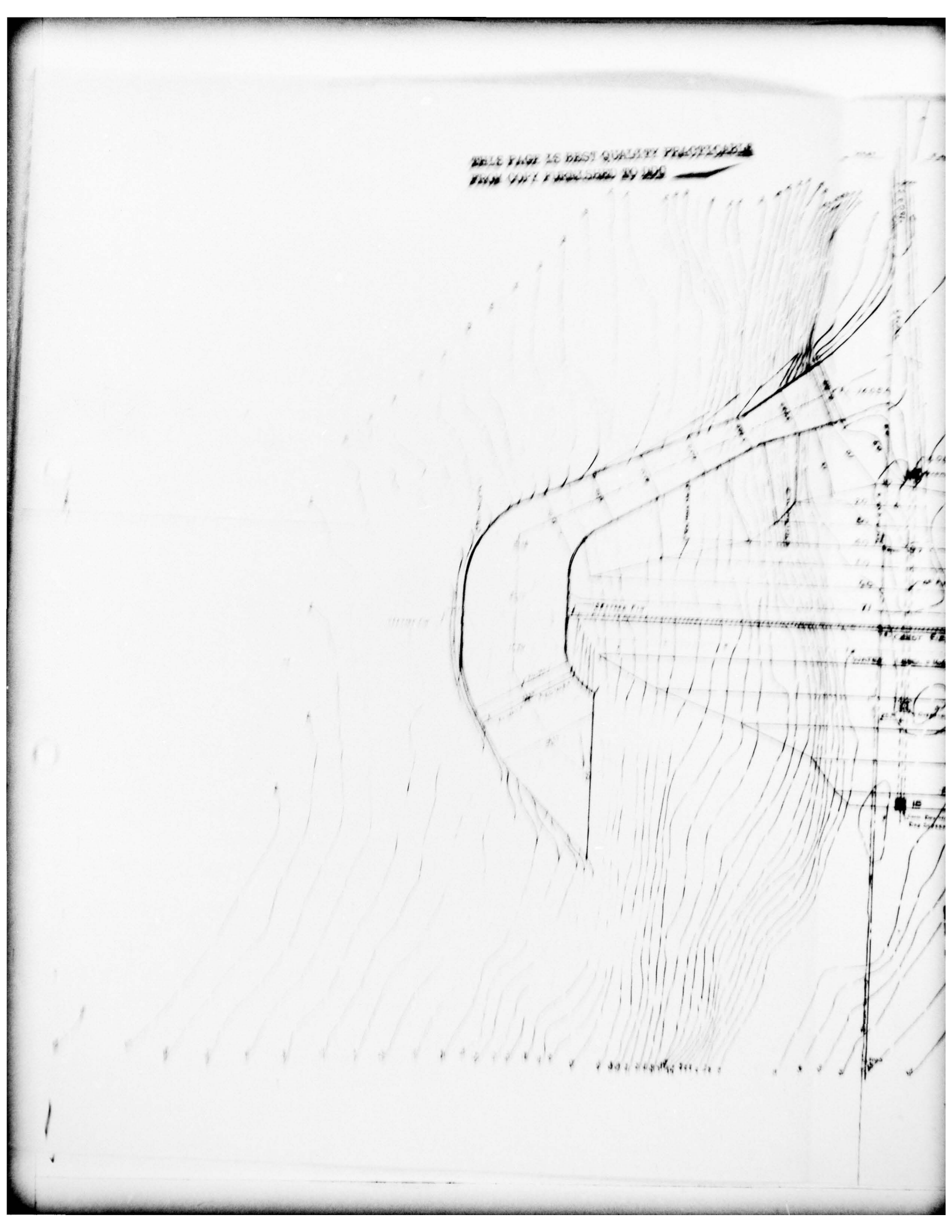
PLATE IV

Sloughage



Conduit
Conduit Outlet
and Right
Abutment Seepage

PLATE V



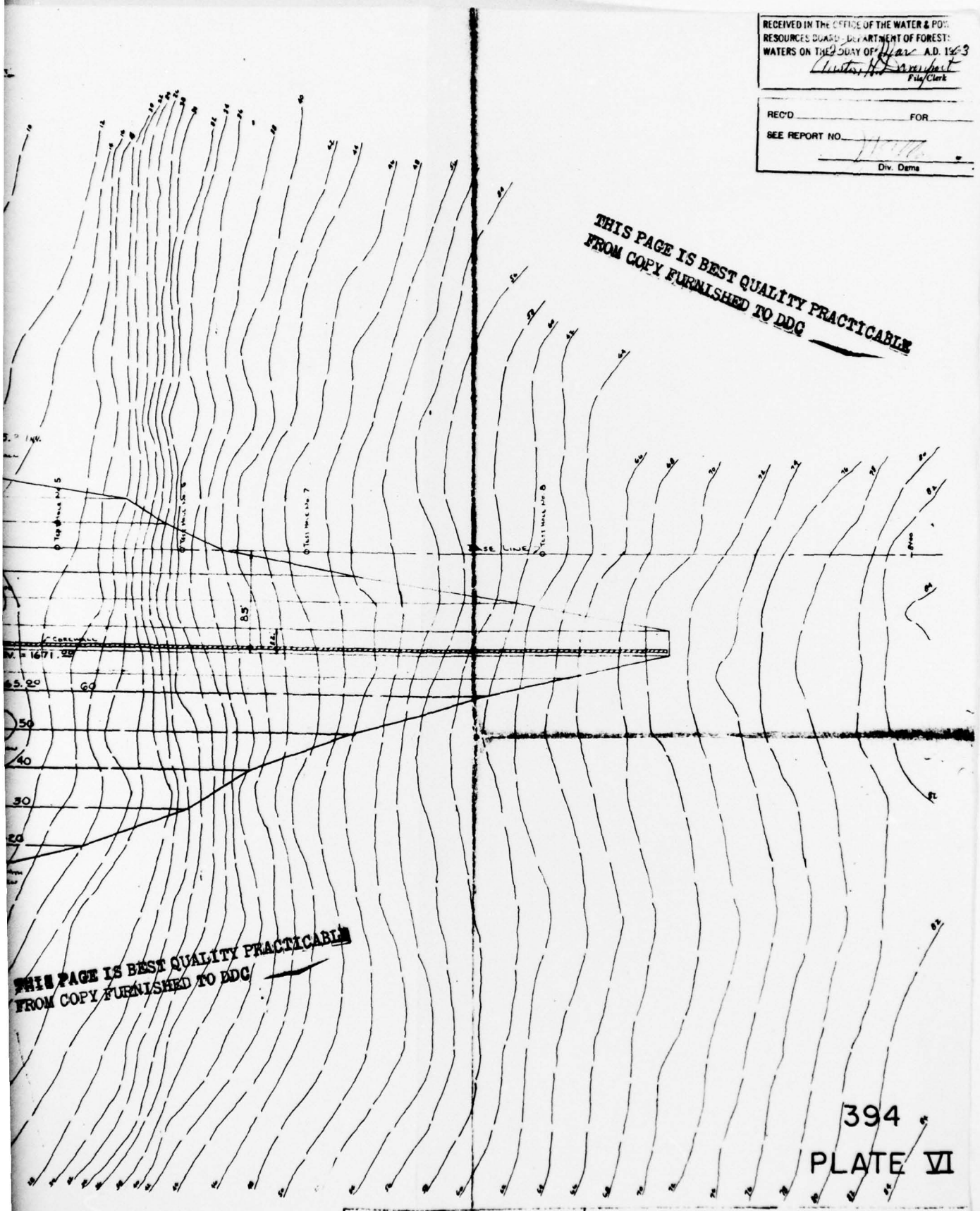


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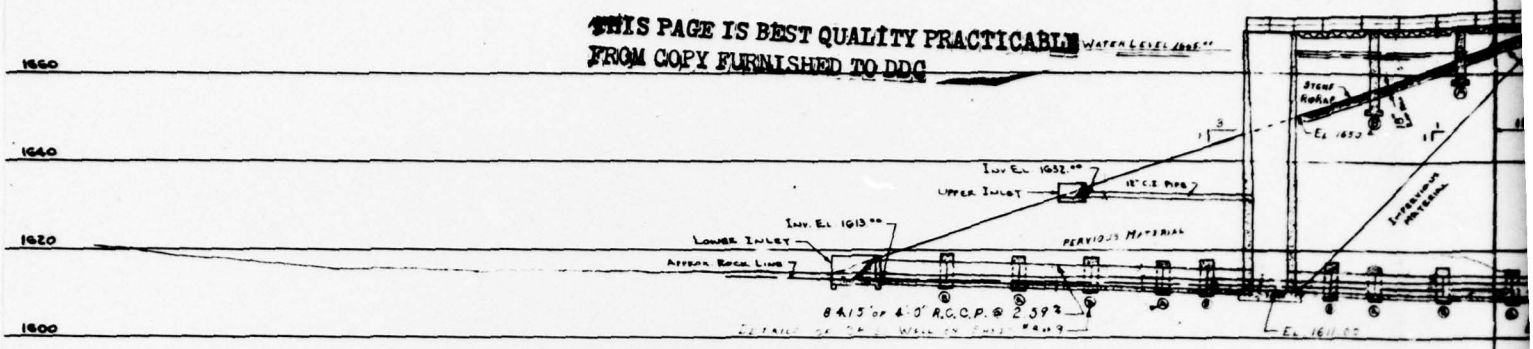
PLATE VI

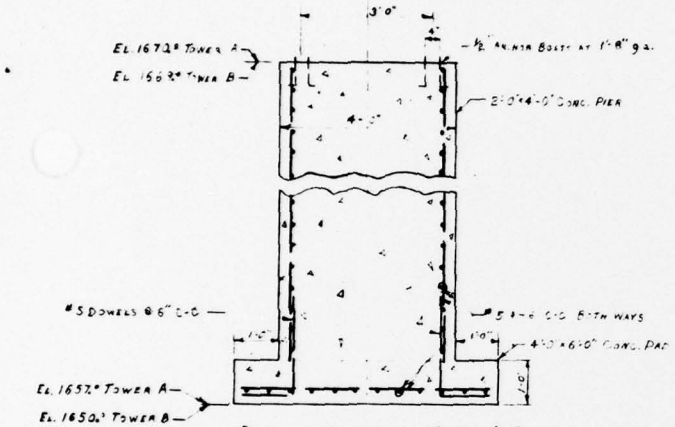
REVISIONS	SURVEY BY
1	DRAWN BY
2 SPILLWAY REV	TRACED BY
3 SEEPAGE PIT ADDED	SCALE 1"=50'
	DECEMBER 1, 1962

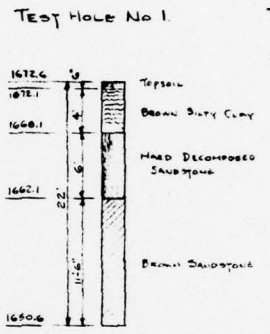
EMBANKMENT PLAN
RESERVOIR CONSTRUCTION
LOCK HAVEN CITY AUTHORITY

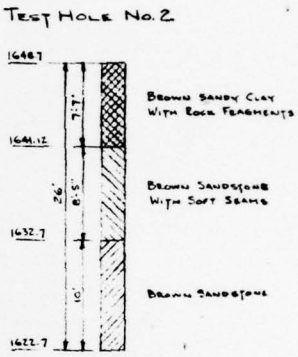
WARREN MOHL - REGISTERED ENGINEER

1 NOTE



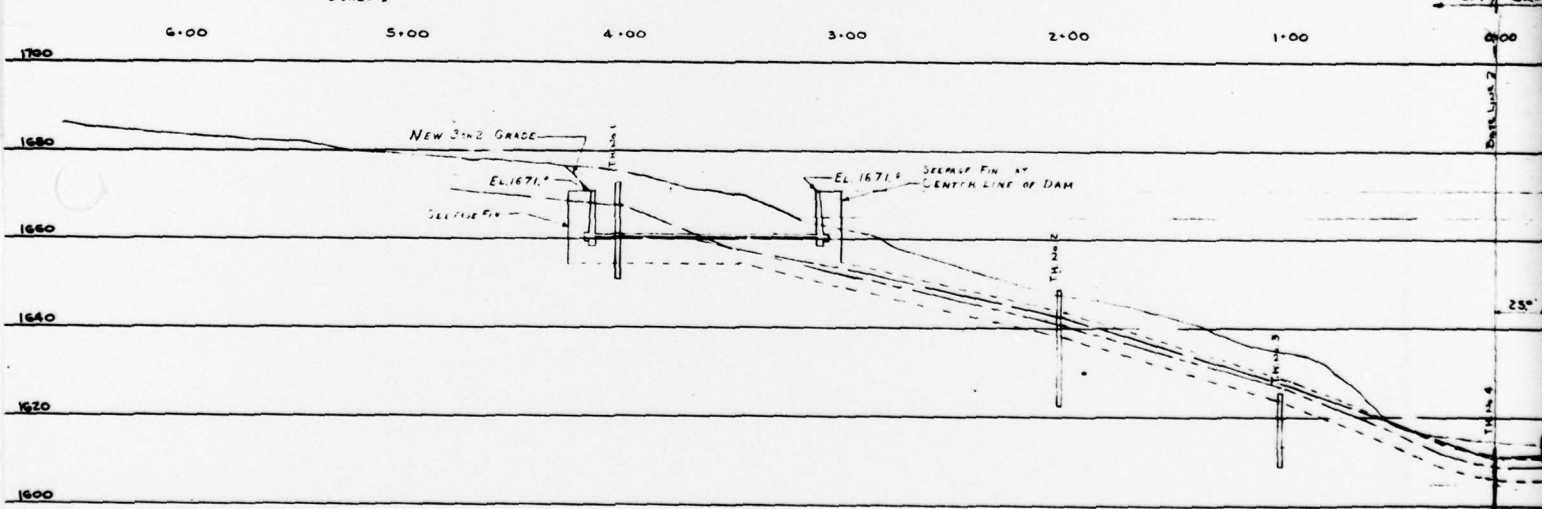


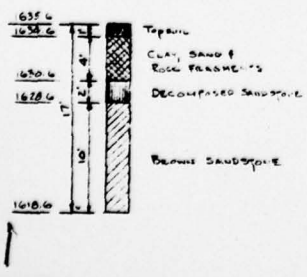


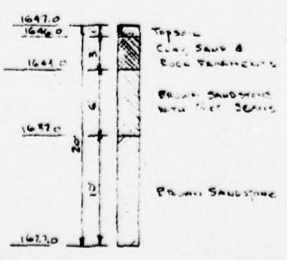


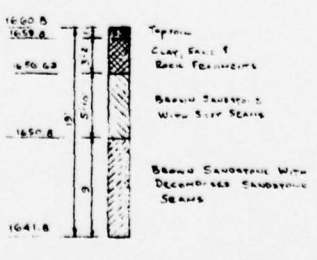
Cross-Section

Scale: Hor. Ver.







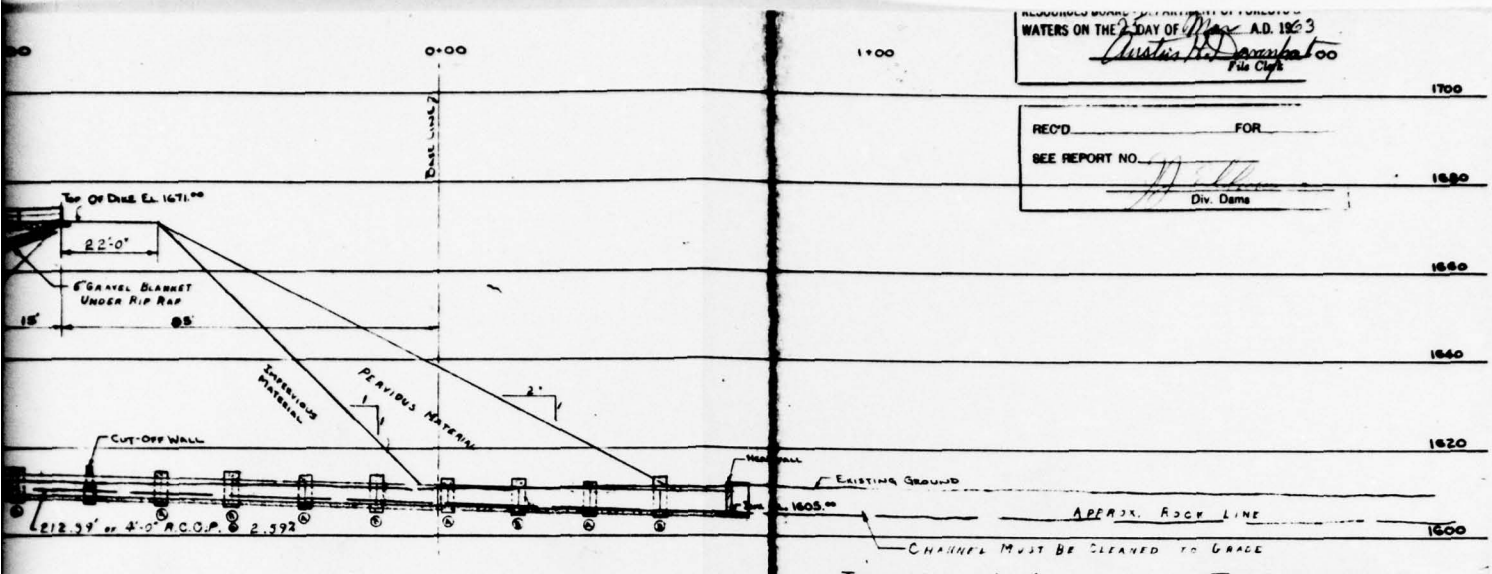


Longitudinal Section (Looking

Scale: Hor. Ver.

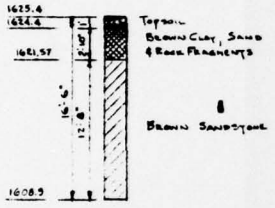
WATERS ON THE 2 DAY OF May A.D. 1963
Austin A. Dornfeat
File Clerk

REC'D _____ FOR _____
SEE REPORT NO. _____
Div. Dams

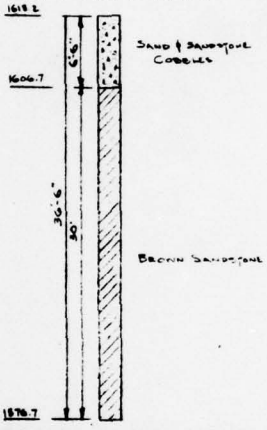


TEST HOLE #3

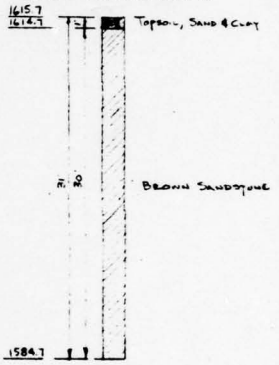
100' SOUTH OF BASE LINE
(LOOKING WEST)
HOR. 1" = 20'
VERT. 1" = 20'



TEST HOLE NO. 4



TEST HOLE NO 5



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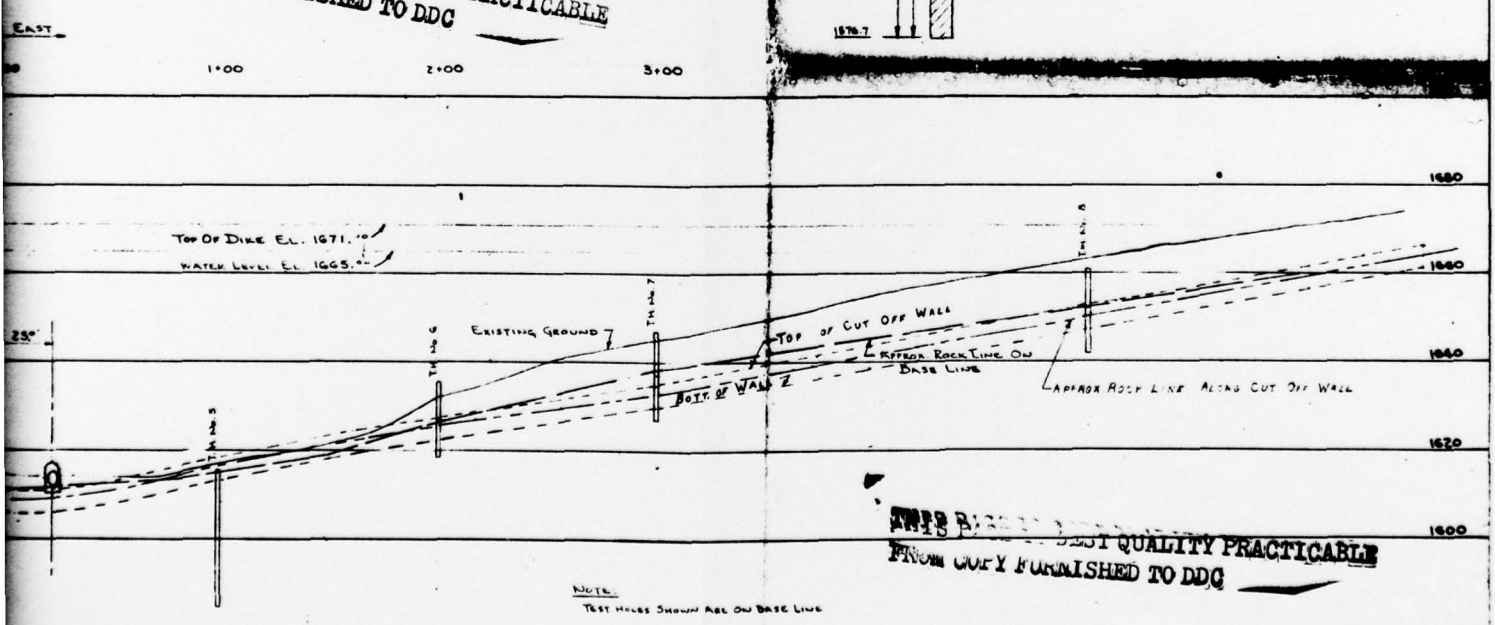

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NOTE
TEST HOLES SHOWN ABE ON BASE LINE

ON 85' LINE SOUTH OF BASE LINE
(LOOKING NORTH)
HOR. 1" = 40'
VERT. 1" = 20'

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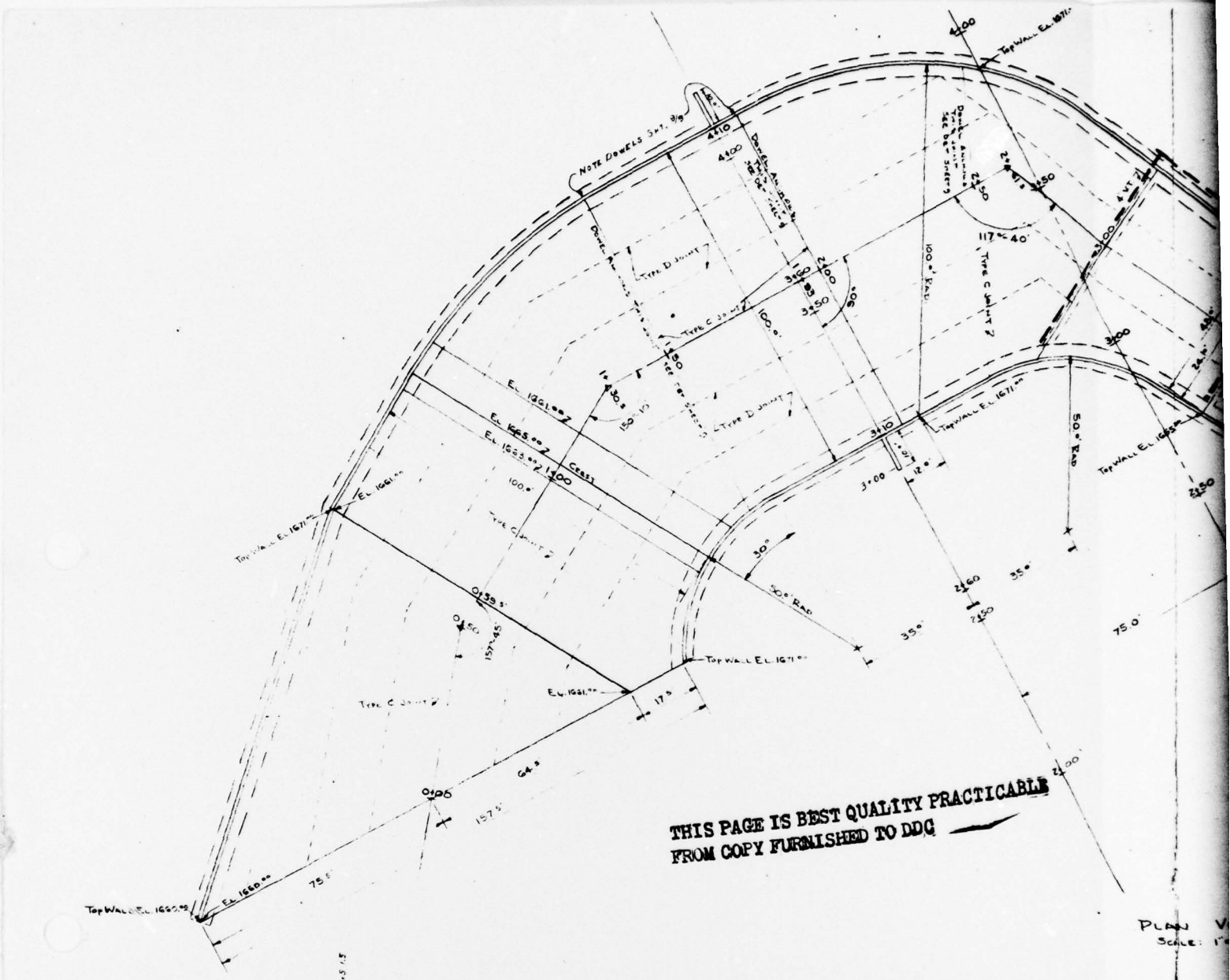
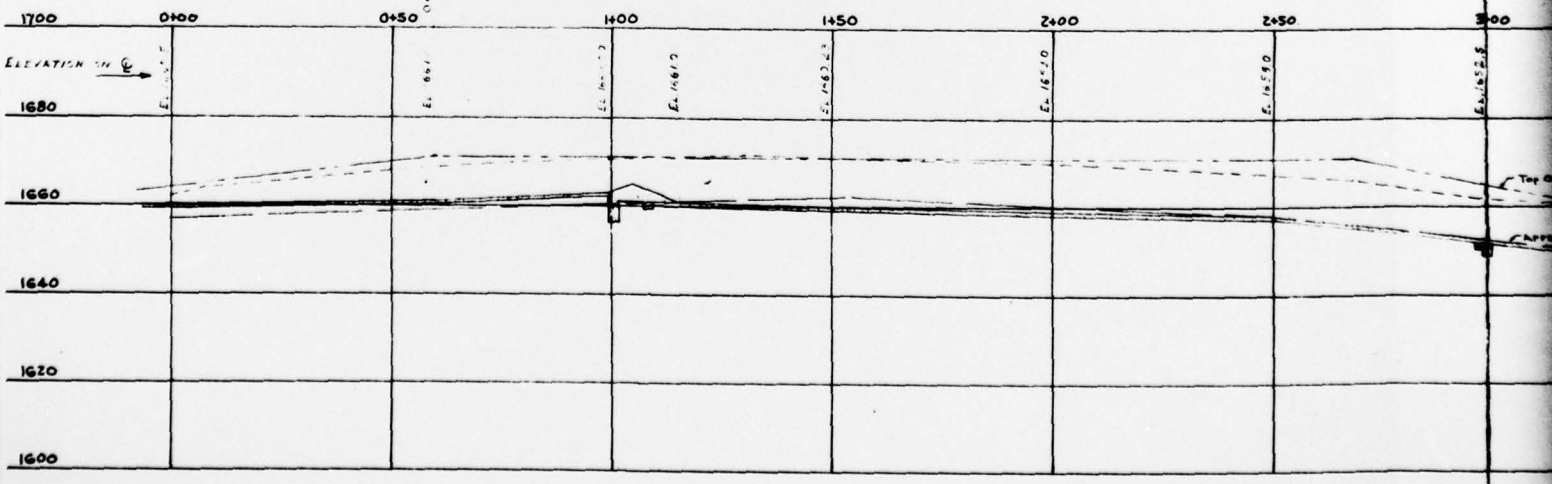
PLATE VII

REVISIONS	
1	
2	
3	
4	
5	

SURVEY BY
DRAWN BY
TRACED BY
SCALE AS NOTED

EMBANKMENT DETAILS
RESERVOIR CONSTRUCTION
LOCK HAVEN CITY AUTHORITY





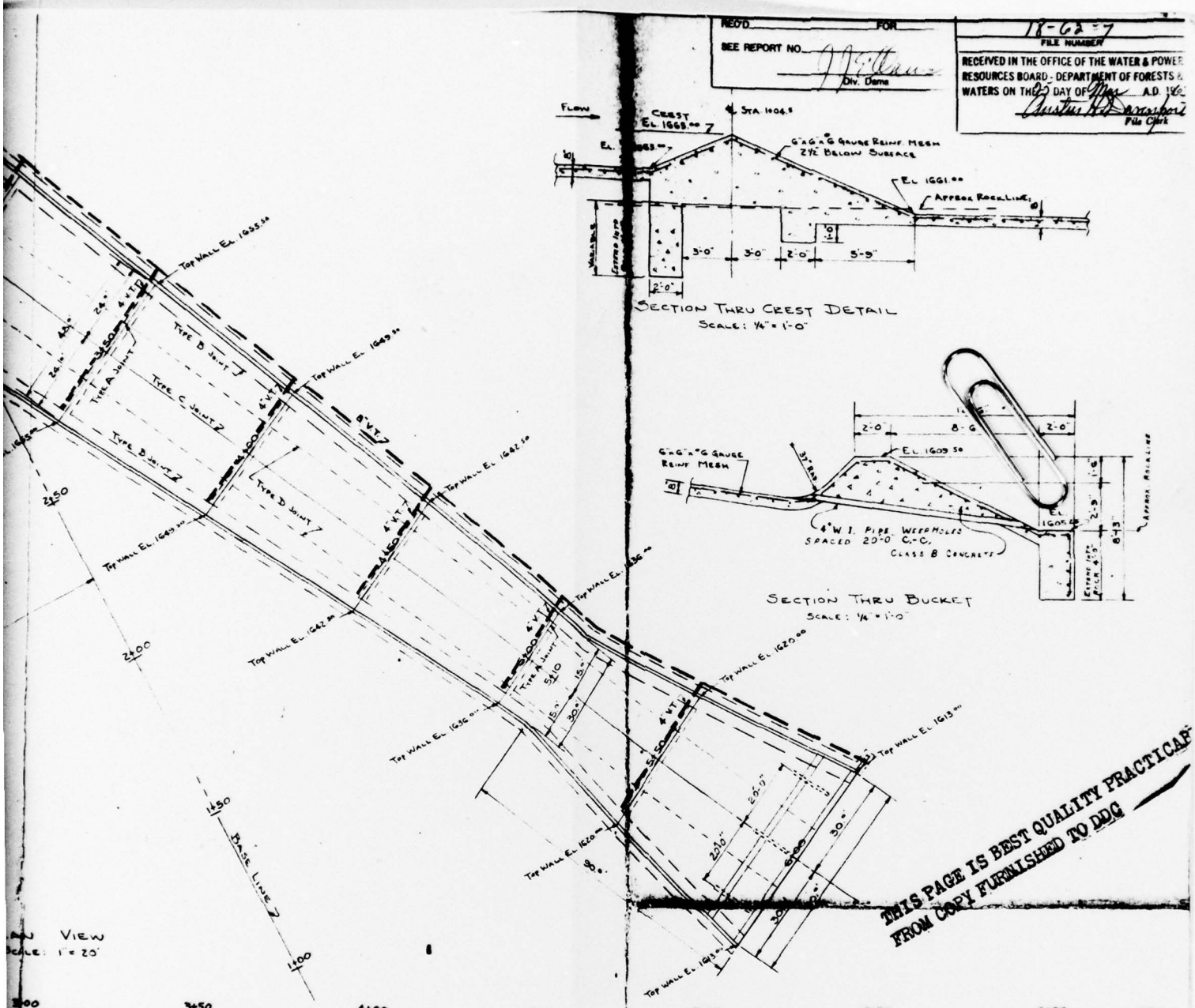
REC'D _____ FOR _____

BEE REPORT NO. _____ Div. Dams

18-62-7
FILE NUMBER

RECEIVED IN THE OFFICE OF THE WATER & POWER RESOURCES BOARD - DEPARTMENT OF FORESTS & WATERS ON THE 25 DAY OF May A.D. 19[illegible]

Justus R. Barnard
File Clerk



394 2

PLATE VIII

REVISIONS	SURVEY BY

SPILLWAY & DETAILS